UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/838,801	04/20/2001	Alexander Berk	SPSC/0103	3353

7590 09/23/2004	EXAMINER
Brian M. Dingman, Esq. Mirick, O'Connell, DeMallie & Lougee, LLP 100 Front Street Worcester, MA 01608	HOGAN, MARY C

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<table>
<tr><td rowspan="2">Office Action Summary</td><td>Application No.</td><td>Applicant(s)</td><td></td></tr>
<tr><td>09/838,801</td><td colspan="2">BERK ET AL.</td></tr>
<tr><td></td><td>Examiner</td><td>Art Unit</td><td></td></tr>
<tr><td></td><td>Mary C Hogan</td><td>2123</td><td></td></tr>
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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>27 August 2001</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-33</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-33</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>20 April 2001</u> is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1.   This application has been examined.

2.   **Claims 1-33** have been examined and rejected.

Oath/Declaration

3.   The oath or declaration is defective because: The specification to which the oath or declaration is directed has not been adequately identified. The title of the application is missing. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

Specification

4.   The disclosure is objected to because of the following informalities. Appropriate correction is required.

5.   **Page 1, line 16**: The reference to Figure 1 does not point to Figure 1a or 1b, making it unclear as to what figure is being discussed.

6.   The attempt to incorporate subject matter into this application by reference to the following documents is improper because they are non-patent publications: "MODTRAN4 User's Manual" (referred to on page 3, line 17) and "MODTRAN Cloud and Multiple Scattering Upgrades with Application to AVIRUS" (referred to on page 3, line 19-20). This is improper according to MPEP 608.01(p), section A which states: "In any application which is to issue as a U.S. patent, essential material may not be incorporated by reference to (1) patents or applications published by foreign countries or a regional patent office, **(2) non-patent publications**, (3) a U.S. patent or application which itself incorporates "essential material" by reference, or (4) a foreign application".

Drawings

7.   **Figures 1a, Figure 2, Figure 3, Figure 4** should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. The MODTRAN4 model and LBL model are admitted prior art as discussed in the background of the invention. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted

by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

8.   **Claims 3,5,6,16,21 and 22** are objected to because of the following informalities. Appropriate correction is required.

9.   **Claims 3,5,6,21 and 22** state: "the calculating step", however, it is unclear as to which calculating step in **Claim 1** this refers to, the "calculating equivalent widths" step or the "calculating line tail absorption" step.

10.   **Claims 5 and 21** should read "line-tail" for consistency.

11.   **Claim 16:** last line "bin from the bin" should read "bin width from the bin".

Claim Interpretation

12.   **Claims 3,6 and 22** refer to the "calculating step". It was determined that the calculating step referred to in this claim is the "calculating equivalent widths" step in **Claim 1**.

13.   **Claims 5 and 21** refer to the "calculating step". It was determined that the calculating step referred to in this claim is the "calculating line tail absorption" step in **Claim 1**.

35 USC § 101

14.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

15.   **Claims 1-33** are rejected under 35 U.S.C. 101 because the claimed invention is not supported by an asserted or well established utility and is not tangible.

16.   An invention, which is eligible for patenting under 35 U.S.C.101, is in the useful arts when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a ***useful, concrete and tangible result.*** The test for practical application as applied by the examiner involves the determination of the following factors:

> (1) Useful- The Supreme Court in *Diamond v. Diehr* requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to

determine whether the asserted utility is accomplished. Applying utility case law the examiner will note that:

(a) the utility need not be expressly recited in the claims, rather it may be inferred.

(b) if the utility is not asserted in the written description, then it must be well established.

(2) Tangible - Applying *In re Warmerdam*, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. 101. In *Warmerdam* the abstract idea of a data structure became capable of producing a useful result when it was fixed in a tangible medium which enabled its functionality to be realized.

(3) Concrete- Another consideration is whether the invention produces a concrete result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.

17.   Furthermore, although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

18.   **Claims 1-33** are rejected under 35 U.S.C. 101 because they appear to be reciting a mathematical algorithm without practical application in the technological arts, therefore, not producing a concrete, useful and tangible result.

Claim Rejections - 35 USC § 102

19.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

20.   **Claims 1 and 2** are rejected under 35 U.S.C. 102(b) as being anticipated by Abreu et al (U.S. Patent Number 5,315,513), herein referred to as. **Abreu**.

21.   As to **Claim 1**, **Abreu** teaches: a band model method for computing individual atomic transmittances through a gaseous medium **(column 2, line 67-column 3, line 4)**. **Abreu** teaches dividing

the spectral region being considered into a number of spectral bins, each having a width of less than 1.0 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of less than 1.0 cm^{-1}. **Abreu** teaches calculating the equivalent width of atomic and molecular transitions centered within each spectral bin **(column 15, lines 3-21)**. Further, **Abreu** teaches calculating line tail absorption within each spectral bin from atomic and molecular transitions not centered within the bin **(column 13, lines 1-5).**

22.   As to **Claim 2, Abreu** teaches the spectral bins have a width of about 0.1 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1.0 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of about than 0.1 cm^{-1}.

Claim Rejections - 35 USC § 103

23.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

24.   The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.

2.   Ascertaining the differences between the prior art and the claims at issue.

3.   Resolving the level of ordinary skill in the pertinent art.

4.   Considering objective evidence present in the application indicating obviousness or nonobviousness.

25.   **Claims 3,4,17-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu** as applied to **Claim 1** above, and further in view of Piters et al (Piters et al, "A Combined Fourier-Bessel

Transformation Method to Derive Accurate Rotational Velocities", Astronomy and Astrophysics Supplement Series 118, 1996, pages 529-544), herein referred to as **Piters**.

26.   As to **Claims 3,4,17 and 20**, **Abreu** teaches dividing the spectral region being considered into a number of spectral bins **(column 4, lines 54-55)** and calculating the equivalent width of atomic and molecular transitions using an approximation to Voigt's line shape **(column 14, lines 63-66)**.

27.   **Abreu** does not expressly teach using an exact expansion to Voigt's function wherein the exact expansion is an exact modified Bessel functions expansion.

28.   **Piters** teaches an exact expansion Voigt's function wherein the exact expansion is an exact modified Bessel functions expansion **(page 530, equations 5-8 and description)**.

29.   It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify calculation of the equivalent widths of atomic and molecular transitions using an approximation to Voigt's function as taught in **Abreu** by using an exact expansion Voigt's function wherein the exact expansion is an exact modified Bessel functions expansion as taught by **Piters (page 530, equations 5-8 and description)** since **Piters** and **Abreu** are both directed to spectral analysis in atmospheric conditions and **Piters** is directed to known spectral analysis techniques.

30.   As to **Claims 5 and 21**, **Abreu** teaches the calculating step includes subtracting line-tail absorption as calculated from the column strength, the Lorentz half-width, the Doppler half-width, and the line tail spectral displacement **(column 15, equation 22 and 24)**.

31.   As to **Claims 6 and 22**, **Abreu** teaches the calculating step includes determining the Voigt line-shape function computed at specific frequencies **(column 7, lines 7-9)**.

32.   As to **Claim 18**, **Abreu** teaches the spectral bins have a width of less than 1.0 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of less than 1.0 cm^{-1}.

33.   As to **Claim 19**, **Abreu** teaches the spectral bins have a width of about 0.1 cm^{-1} **(column 4, lines 54-55)** wherein the bins are 1.0 cm^{-1} in width, but since they cover the region from 0 to 50,000 cm^{-1}, or 0.2um to infinity, it is noted that the bins of 1 cm^{-1} cover the same spectral region of interest as would for bins having a width of about than 0.1 cm^{-1}.

34.   **Claims 7, 23, 24,30-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu** as applied to **Claim 1** above, and further in view of Martin et al (Martin et al, "Generalized Lorentzian Approximations for the Voigt Line Shape" Applied Optics, Vol. 20, No.2, January, 1981, pages 259-263), herein referred to as **Martin**.

35.   As to **Claims 7 and 23**, **Abreu** teaches dividing the spectral region being considered into a number of spectral bins **(column 4, lines 54-55)** calculating line tail absorption within each spectral bin from atomic and molecular transitions not centered within the bin **(column 13, lines 1-5).**

36.   **Abreu** does not expressly teach calculating line tail absorption within each bin from atomic and molecular transitions centered outside of the bin using Pade approximant spectral fits to Voigt absorption coefficient curves.

37.   **Martin** teaches using Pade approximant spectral fits to Voigt absorption coefficient curves since the Pade method obtains simple and adequate approximations to a given function, useful to the spectroscopist since the Pade method does not introduce new artificial parameters as would be introduced if approximating the Voigt function by a sum of Lorentzian and Gaussian functions **(page 259, column 2)**.

38.   It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the calculation of line tail absorption as taught in **Abreu** to use a Pade approximant spectral fits to the Voigt absorption coefficient curves as taught by **Martin** since the Pade method obtains simple and adequate approximations to a given function, useful to the spectroscopist since the Pade method does not introduce new artificial parameters as do by approximating the Voigt function by a sum of Lorentzian and Gaussian functions **(page 259, column 2)**.

39.   As to **Claims 8,14,15, 24,30 and 31**, **Abreu** teaches: the line tail absorption calculation step includes determining a database of temperature and pressure dependent band model parameters combined with integration over Voigt's line shape **(column 6, lines 6-8, column 7, lines 26-28, column 10, lines 58-60)**. Since the Voigt curves are determined using a model based on temperature and pressure dependent model parameters, it is concluded that if Pade approximates are used to determine approximant spectral fits to the Voigt absorption coefficient curve, the approximates would be temperature and pressure dependent. Further, the temperature and pressure dependent parameters are saved to a database **(column** 13, lines 55-57).

40.   As to **Claim 28**, **Martin** teaches one Pade parameter is the derivative of the absorption coefficient with respect to the normalized spectral variable at the line center **(page 259, Introduction),** where "b" is the normalization parameter.

41.   As to **Claim 29**, **Martin** teaches one Pade parameter is the integral of the spectral absorption coefficient over the spectral band **(page 259, Introduction, page 260, equation 10)** wherein a Pade parameter is the approximation to Voigt's integral.

42.   As to **Claim 32**, **Abreu** teaches the spectral bins have a width of less than 1.0 cm⁻¹ **(column 4, lines 54-55)** wherein the bins are 1 cm⁻¹ in width, but since they cover the region from 0 to 50,000 cm⁻¹, or 0.2um to infinity, it is noted that the bins of 1 cm⁻¹ cover the same spectral region of interest as would for bins having a width of less than 1.0 cm⁻¹.

43.   As to **Claim 33**, **Abreu** teaches the spectral bins have a width of about 0.1 cm⁻¹ **(column 4, lines 54-55)** wherein the bins are 1.0 cm⁻¹ in width, but since they cover the region from 0 to 50,000 cm⁻¹, or 0.2um to infinity, it is noted that the bins of 1 cm⁻¹ cover the same spectral region of interest as would for bins having a width of about than 0.1 cm⁻¹.

44.   **Claims 9,10,25-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu and Martin**, as applied to **Claims 7 and 23** above, and further in view of Weisstein (Weisstein, Eric, CRC Concise Encyclopedia of Mathematics, Chapman & Hall/CRC, 1999, pages 1297-1298), herein referred to as **Weisstein**.

45.   As to **Claims 9,10, 25 and 26**, **Abreu and Martin** teach using Pade approximant spectral fits to Voigt absorption coefficient curves **(Martin: page 259, column 2)** and teaches the power series to be approximated by the Pade method **(Martin: page 260, equation 10)** where n is the number of poles.

46.   **Abreu and Martin** do not expressly teach there are five Pade parameters wherein the Pade parameters are determined from summed line tail spectral absorption coefficients.

47.   **Weisstein** teaches the Pade approximants to a power series wherein an n number of Pade coefficients and approximates are found **(page 1297, column 2 and page 1298)**.

48.   It would have been obvious to one of ordinary skill in the art at the time the invention was made that the Pade approximation includes an expansion of a power series that can include the calculation of any given number of coefficients and approximates for a given number of poles. Therefore, it is the Pade method could yield five parameters. Further, it is concluded that if this method is used to expand and approximate Voigt's function which is used to calculate line tail spectral absorption, as taught by **Abreu and Martin**, than the Pade parameters would be determined from summed line tail spectral absorption coefficients as taught by **Weisstein (page 1298, equations 7-12 and column 2, Pade Approximates)**.

49.   As to **Claims 11 and 27**, **Abreu and Martin** teach one Pade parameter is determined at the center of the bin, and one at each edge of the bin **(Martin: page 259, Introduction and Abreu: column**

6, lines 21-22), wherein Voigt's lineshape is integrated over a bin, encompassing the center of the bin and the edges of the bin.

50. As to **Claim 12, Abreu and Martin** teach wherein one Pade parameter is the derivative of the absorption coefficient with respect to the normalized spectral variable at the line center (**Martin: page 259, Introduction**), where "b" is the normalization parameter.

51. As to **Claim 13, Abreu and Martin** teach the Pade parameter is the integral of the spectral absorption coefficient over the spectral band **(Martin: page 259, Introduction, page 260, equation 10)** wherein a Pade parameter is the approximation to Voigt's integral.

52. **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Abreu** as applied to **Claim 1** above, and further in view of Applicant's Own Admission, herein referred to as **AOA**.

53. As to **Claim 16, Abreu** teaches the equivalent width is calculated from atomic and molecular transitions located outside the bin **(column 15, equation 22)** wherein W_{sl}^1 indicated the tail contribution, and the tail line absorptions are calculated from atomic and molecular transitions not centered within a half spectral bin width from the bin **(column 13, lines 1-5).**

54. **Abreu** does not expressly teach the atomic and molecular transitions are centered no more than half a spectral bin width from the bin.

55. **AOA** teaches the equivalent widths are calculated from atomic and molecular transitions centered no more than half a spectral bin width from the bin since offsetting the location of the effective line from the center of the bin gives a more representative result for the average absorption of the two line tails **(page 5, lines 20-23)**.

56. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the calculation of equivalent widths from atomic and molecular transitions located outside the bin as taught in **Abreu** with calculating the equivalent widths from atomic and molecular transitions centered no more than half a spectral bin width from the bin since offsetting the location of the effective line from the center of the bin gives a more representative result for the average absorption of the two line tails **(page 5, lines 20-23)** as taught in **AOA**.

Conclusion

57.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary C. Hogan whose telephone number is 703-305-7838 or 571-272-3712 starting mid-October 2004. The examiner can normally be reached on 7:30AM-5PM Monday-Friday. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703-305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mary C Hogan
Examiner
Art Unit 2123